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(54) **Mobile terminal circuit including an RFID tag and wireless identification method using the same**

Schaltkreis für ein mobiles Endgerät mit einem RFID Transponder und diesen nutzendes Verfahren

Circuit de terminal mobile contenant une étiquette d'identification radio fréquence et procédé l'utilisant

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Description

[0001] The present invention relates generally to a radio frequency identification (RFID) tag, which is increasing in frequency of use and importance, and a widely-spread mobile terminal, and in particular, to a mobile terminal circuit including an RFID tag in one body and a wireless identification method using the same.

[0002] An RFID transponder, or an RFID tag, was developed by United States National Laboratory for Department of Agriculture for the purpose of identifying livestock. An electric code for identifying an animal is recorded in a RFID tag, and then inserted into or attached to the animal. An interrogator (or a reader) for reading the electric code is installed in a cattle shed to conveniently monitor whether an animal has returned. The reader transmits an RF (Radio Frequency) signal to the RFID tag, and then, an electric code recorded in the RFID tag is delivered to the reader after being modulated by a modulator in the RFID tag. This procedure is called "back-scatter modulation." The RFID tag has an antenna coil to transmit the modulated signal to the reader therethrough. An early such system is well disclosed in U.S. Patent Nos. 4,075,632 and 4,360,810.

[0003] Over time, technology for identifying a moving object has been applied to additional fields other than cattle management. For example, such technology has been applied to a vehicle, a container vessel, a railcar, etc., and information recorded in an RFID tag of such transportation means is used in tracking a position of the transportation means and identifying the contents of freight. Such applications and related arts are well disclosed in U.S. Patent Nos. 4,739,328, 4,782,345, 4,786,907, 4,816,839, 4,835,377, and 4,853,705.

[0004] Recently, RFID technology is tested in various fields, and among the various fields, a communication system has attracted public attention due to its various possible applications. For example, since a mobile communication system holds a great number of subscribers, it can easily make profits by commercializing an application service based on the RFID technology. Currently, a mobile communication system has been saturated in terms of an earning rate, so service providers are eagerly searching for new application services capable of creating additional profits.

[0005] If RFID technology is introduced into the mobile communication system, it is expected that various additional services for a cellular environment can be provided. Accordingly, it is most urgently necessary to combine current RFID devices to a current cellular system.

[0006] Related prior art is disclosed in WO 01/39103 A1, WO 03/025834 A1, an IEEE paper entitled "RF Rendez-Blue: Reducing Power And Inquiry Costs In Bluetooth-Enabled Mobile Systems", Hall, E.S.; Vawdrey, D.K.; Knutson, C.D.; Computer Communications and Networks, 2002. Proceedings. Eleventh International Conference on, 14-16 Oct. 2002 and Korean Patent Publication No. 2002-0090929.

[0007] WO 01/39103 A1 discloses a mobile terminal in which an identification (ID) module is added between an RF block and an antenna, and the mobile terminal includes a Bluetooth module. The ID module includes a mixer, and the mixer converts a backscatter type message transmitted from the ID module to a reader at an RFID frequency of 2.45GHz into a baseband message before transmission so that it can be processed in a computer, or transmits the backscatter type message to a base station over a traffic channel specified by a mobile communication standard or a Bluetooth channel. This technology is characterized by connecting an independent ID module to an existing mobile terminal circuit via a mixer. Through this, a base frequency band, i.e., an exiting traffic channel or Bluetooth channel, is used as an RFID frequency band. Therefore, a combination between heterogeneous circuits is not described herein.

[0008] WO 03/025834 A1 discloses a mobile terminal combined with an RFID reader, in which information is transmitted and received over a frequency band of the mobile terminal. However, the reference does not mention that instead of the RFID reader, an RFID tag can be combined with the mobile terminal. In addition, since combination between the RFID reader circuit and the terminal circuit is not disclosed, one skilled in the art cannot predict a combination of the RFID tag circuit and the terminal circuit in the light of the connection between the RFID reader circuit and the terminal circuit.

[0009] The IEEE paper discloses a structure for connecting an RFID module to a Bluetooth module in parallel in order to reduce an initial processing time of the Bluetooth module, and this is very different from a single-body type structure proposed by the present invention.

[0010] Korean Patent Publication No. 2002-0090929 discloses technology in which an independent smart card sends data to a main processing unit (MPU) of a mobile terminal. However, the reference fails to propose the connection between the smart card and the MPU or its peripheral circuit. That is, it is nothing more than simply arranging an independent circuit and a processor in one device.

[0011] The above references mainly disclose parallel connection between an RFID module or tag and a terminal circuit, or propose resource sharing in terms of frequency. However, the conventional technologies have the following disadvantages.

[0012] First, it is difficult to achieve miniaturization of a mobile terminal. Although an RFID tag can be implemented through combination of one chip with an antenna coil, it must be implemented in a smaller size to meet a general tendency toward miniaturization of the mobile terminal.

[0013] Second, since the conventional RFID tag does not have its own power supply, electromotive force induced from a carrier of an RFID reader is used as electric power. In this case, it is difficult to provide sufficient electric power to the RFID tag in an environment where an air environment between the RFID reader and the RFID

tag is influenced by noises. As a result, the RFID tag may operate incorrectly.

[0014] WO 03/061146 A refers to a communication unit for identifying objects or persons, comprising a receiver/transmitter unit according to a so-called Bluetooth system and a transponder according to a so-called RFID system. In the described communications unit, the transponder is integrated with the receiver/transmitter unit so as to enable components associated with the receiver/transmitter unit to be used for transponder operation also. The transponder is provided with its own battery for supplying power to the control logic of the transponder.

[0015] It is, therefore, the object of the present invention to provide a mobile terminal circuit including an RFID tag, capable of securing miniaturization of the mobile terminal and a stable and flexible RFID operation, and a wireless identification method using the same.

[0016] This object is solved by the subject matters of the independent claims.

[0017] Preferred embodiments are defined in the dependent claims.

[0018] The features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a block diagram illustrating a structure of a conventional RFID tag;
FIG. 2 is a block diagram illustrating a structure of a conventional mobile terminal;
FIG. 3 is a detailed block diagram illustrating the MPU illustrated in FIG. 2;
FIG. 4 is a block diagram illustrating a structure of a mobile terminal including an RFID tag according to a first embodiment of the present invention;
FIG. 5 is a block diagram illustrating a structure of a mobile terminal including an RFID tag according to a second embodiment of the present invention; and
FIG. 6 is a block diagram illustrating a structure of a mobile terminal including an RFID tag according to a third embodiment of the present invention.

[0019] Several preferred embodiments of the present invention will now be described in detail herein below with reference to the annexed drawings. In the drawings, the same or similar elements are denoted by the same reference numerals even though they are depicted in different drawings. In the following description, detailed descriptions of known functions and configurations incorporated herein have been omitted for conciseness.

[0020] FIG. 1 is a block diagram illustrating a structure of a passive RFID tag. More specifically, FIG. 1 illustrates RFID tag chip model No. MCRF200 made by Microchip. Referring to FIG. 1, a coil interface 209 is a connection part between an antenna coil (not shown) and RFID circuit elements. The antenna coil generates induced electromotive force through inductive coupling between an RFID reader (not shown) and the RFID tag in accordance with Faraday's law as the RFID reader approaches the RFID tag. A voltage level of the antenna coil is changed according to a modulated signal output from a modulation circuit (not shown) in the coil interface 209. A rectifier 202 rectifies an AC (Alternating Current) voltage of the induced electromotive force, and provides a DC (Direct Current) voltage to the other elements of the RFID tag circuit. A clock generator 201 generates a system clock by extracting a carrier frequency from a signal transmitted from the RFID reader. This clock provides a baud rate, a modulation rate, and a programming rate to the other elements. A row decoder 204 and a column decoder 207 extract ID data stored in a memory 206 at a clock rate, and encode the extracted ID data by non-return zero (NRZ) direct coding, differential biphase coding, or Manchester biphase coding before modulation, to thereby generate a serial data stream. A modulation controller 203 modulates a serial data stream received via the decoders 204 and 207 by a predetermined modulation scheme, e.g., frequency shift keying (FSK) or phase shift keying (PSK), and delivers the modulated data stream to the coil interface 209. A counter 205 counts a clock output from the clock generator 201, and provides a count value to the row decoder 204 and the column decoder 207.

[0021] FIG. 2 is a block diagram illustrating a structure of a conventional mobile terminal. Referring to FIG. 2, a main processing unit (MPU) 100 controls the overall operation of the mobile terminal. The MPU 100 is provided with a system clock SCLK. A memory portion 102 is comprised of a system RAM (Random Access Memory) 72, a flash ROM (Read Only Memory) 74, and an EEPROM (Electrically Erasable and Programmable ROM) 76. An RF (Radio Frequency) block 111 processes an RF signal transmitted/received via an antenna (not shown). A baseband block 110 converts a digital signal received from the MPU 100 into an analog signal, generates an IF (Intermediate Frequency) signal from the analog signal, and delivers the IF signal to the RF block 111. Further, the baseband block 110 processes an IF signal received from the RF block 111 and delivers the IF signal to the MPU 100.

[0022] A keypad 108 and a display 109 serve as an input means and an output means, respectively. A vocoder 106 converts user voice into a digital signal, and delivers the digital signal to the MPU 100. A SIM (Subscriber Identification Module) card 107, in a GSM (Global System for Mobile communications) system, stores user information and delivers the user information to a related circuit. For example, in a CDMA (Code Division Multiple Access) system, user information in the SIM card can be stored in the memory portion 102.

[0023] Additionally, a battery cell 113 provides electric power to the mobile terminal. A power block 112 provides appropriate electric power to each element of the mobile terminal using the electric power supplied from the battery cell 113.

[0024] FIG. 3 is a detailed block diagram illustrating

the MPU 100 illustrated in FIG. 2. For example, PCF5083 by Philips, AD6526 by Analog Devices, and DSP56654 by Motorola can be used as the MPU 100 of the mobile terminal. As illustrated in FIG. 3, the MPU 100 includes an MPU core 305, a DSP (Digital Signal Processor) 303, a clock generator 302, an RF interface 306, a man-machine interface (MMI) 307, and an interrupt port 304. While the MPU 100 includes other elements, only those illustrated in FIG. 3 are relevant to the present invention. A detailed description of the other elements can be found in the above-cited references.

[0025] In operation, the clock generator 302 receives a source clock (e.g., 13MHz) from the system clock SCLK, divides the source clock, and provides appropriate clocks to the peripheral elements. The MPU core 305 serves as a main operator of the MPU 100. For example, a 32-bit ARM7TDMI® chip by ARM (Advanced RISC Machines) or an M-Core® chip by Motorola can be used as the MPU core 305. The interrupt port 304, one of external ports of the MPU 100, detects an interrupt generated from an external device. The RF interface 306 and the MMI 307 serve as an interface between the MPU core 305 and the RF block 111 and an interface between the MPU core 305 and the keypad 108 and the display 109, respectively. The DSP 303 performs operations requiring fast calculation in a mobile communication system, e.g., modulation/demodulation and baseband modulation.

[0026] FIG. 4 is a block diagram illustrating a structure of a mobile terminal including an RFID tag according to a first embodiment of the present invention. It should be noted that known elements of the mobile terminal other than the elements related to the connection between the mobile terminal and the RFID tag are not illustrated in the drawing for simplicity.

[0027] According to a first embodiment of the present invention, referring to FIG. 4, an MPU 550A of the mobile terminal includes an RFID codec 404 and an RFID modulator 405, which are elements of an RFID tag. Moreover, the memory portion 102 of the mobile terminal additionally stores RFID data 78 together with mobile terminal protocol data.

[0028] Referring to FIG. 2, the EEPROM 76 of the mobile terminal is an element of the memory portion 102. Commonly, the EEPROM 76 stores initial setup values of the RF block 111, the display 109 and a voice volume, a user defined value such as address book data, and WAP (Wireless Application Protocol) data. However, as the latest flash ROM increases in its capacity, data stored in the low-speed EEPROM 76 tends to be stored in the high-speed flash ROM 74. Therefore, it is common that the EEPROM 76 has an enough space capable of storing surplus data. Therefore, it is profitable to store RFID data in this idle space.

[0029] Referring to FIG. 3, the clock generator 302 divides the source clock provided from the system clock SCLK illustrated in FIG. 2 into several clocks, in order to provide appropriate clocks to the peripheral elements. Therefore, it is also possible to additionally divide the source clock into a clock for the elements of the RFID tag.

[0030] In FIG. 4, the RFID modulator 405 can be easily implemented within the MPU 550A. A modulation scheme used in the RFID technology includes FSK or PSK, which is lower in complexity than Gaussian minimum shift keying (GMSK), i.e., a conventional modulation scheme. Therefore, the RFID modulator 405 can be implemented using the conventional related logic and technology. Also, the RFID codec 404 is lower in complexity and simpler in implementation than the conventional communication coding.

[0031] The interrupt port 304 detects an approach of an RFID reader (not shown), and indicates a time when stored RFID data is to be transmitted. If the RFID reader approaches the antenna coil 200, then induced electromotive force is generated and provided to the rectifier 202. The rectifier 202 converts the induced electromotive force into a DC signal. The interrupt port 304 serving as a detector detects the DC signal. Such a detector can also be implemented using a frequency detector instead of the interrupt port 304. When induced electromotive force is generated in the antenna coil 200, it indicates that an electric wave of a particular frequency band is generated. Therefore, the MPU core 305 can detect an approach of the RFID reader through the frequency detector that detects a variation in the frequency. For example, the TDA7021T by Philips can be used as the frequency detector.

[0032] Upon detecting the approach of the RFID reader through the interrupt port 304, the MPU core 305 issues an order that RFID data stored in the memory portion 102 should be delivered to the RFID codec 404. Upon receiving the RFID data, the RFID codec 404 encodes the received RFID data into RFID codec data, and delivers the RFID codec data to the RFID modulator 405. The RFID modulator 405 modulates the RFID codec data, and delivers the modulated RFID data to the RFID reader through the antenna coil 200.

[0033] In FIG. 1, if the RFID reader approaches the RFID tag, the clock generator 201 extracts a clock and provides the clock to the other elements, and the rectifier 202 provides electric power to the elements. At this point, elements other than the rectifier 202 are reset, so it is possible to detect a transmission time of the stored data. However, in a certain environment, an unstable clock may be extracted from a carrier of the RFID reader, causing misoperation of the RFID tag. Also, detecting a data transmission point through power providing can be affected according to a surrounding environment.

[0034] However, the present invention, which has the structure illustrated in FIG. 4 can effectively resolve such problems. That is, since most elements of the RFID tag are arranged in the MPU 550A, stable electric power from the power block 112 is provided to each element of the RFID tag. In addition, the RFID tag is provided with a stable internal clock of the mobile terminal, instead of a clock extracted from the carrier of the RFID reader. As illustrated in FIG. 4, a first clock generator 250 is con-

nected not only to the MPU core 305 and the memory portion 102, but also to electric elements of the mobile terminal circuit, and provides operation timing to them. A system clock SCLK output from the first clock generator 250 is provided to a second clock generator 302, and the second clock generator 302 is connected to the RFID codec 404 and the RFID modulator 405, and provides operation timing to them.

[0035] FIG. 5 is a block diagram illustrating a structure of a mobile terminal including an RFID tag according to a second embodiment of the present invention, in which main elements of the RFID tag are implemented with one IC (Integrated Circuit). It should be noted that known elements of the mobile terminal other than the part related to the connection between the mobile terminal and the RFID tag are not illustrated in the drawing for simplicity.

[0036] As illustrated in FIG. 5, an RFID codec 404, an RFID modulator 405, a second clock generator 302, and an RFID memory 78 are implemented with one IC 600 (hereinafter, referred to as an "RFID chip" or "RFID module"), and various modifications are available. FIG. 6 illustrates an example of one modification.

[0037] In the structure of FIG. 1, the RFID tag has the rectifier 202 and the clock generator 201. However, in the second embodiment of the present invention, instead of the clock generator 201, the second clock generator 302 receives a system clock SCLK, divides the received system clock SCLK and provides appropriate clocks to respective elements, as described in conjunction with FIG. 4. In addition, instead of the rectifier 202, a frequency detector 501 is arranged in the inside or outside of an MPU 550B to detect a variation in a frequency of an electric wave generated from an antenna coil 200 and deliver the detection result to an MPU core 305. The MPU core 305 informs the power block 112 of an operation time of the RFID chip 600 through an enable pin En.

[0038] The frequency detector 501 detects a frequency variation. Detection of the frequency variation can be implemented in several methods. For example, if the frequency detector 501 detects an ACK (acknowledgement) signal having a particular frequency while searching a frequency of an electric wave having a constant frequency generated from the antenna coil 200, it delivers the detected signal to the MPU core 305. The power block 112 provides electric power to the RFID chip 600 to enable an operation of each element.

[0039] Unlike the first embodiment, the second embodiment is characterized by using an RFID tag designed to be suitable to a mobile terminal instead of the conventional RFID tag by avoiding or minimizing modification of a structure of the MPU 550B, thereby achieving generalization and miniaturization of the mobile terminal.

[0040] FIG. 6 is a block diagram illustrating a structure of a mobile terminal including an RFID tag according to a third embodiment of the present invention. Compared with the RFID tag illustrated in FIG. 5, the RFID tag illustrated in FIG. 6 excludes the RFID memory 78 from the RFID module 600, and stores RFID data in the memory portion 102 as described in conjunction with FIG. 4.

[0041] As can be appreciated from the foregoing description, the present invention can implement combination of an RFID tag and a mobile terminal while securing miniaturization of the mobile terminal and a stable operation of the RFID tag. In addition, the present invention minimizes the mobile terminal circuit by increasing generalization of elements in implementing the combination.

[0042] While the present invention has been shown and described with reference to a certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention as defined by the appended claims.

Claims

1. A mobile terminal circuit for transmitting radio frequency identification data to a radio frequency identification reader, comprising:

   an antenna (200) for communicating with the radio frequency identification reader;
   a first clock generator (250) for providing a first operation timing to each electric element of the mobile terminal circuit;
   a radio frequency identification module (600) for performing a radio frequency identification function;
   a power block (112) for providing operation power to the electric elements of the mobile terminal circuit;
   a processor (550B) connected to the power block, the first clock generator, and the radio frequency identification module; and
   a detector (501) connected to the antenna and the processor, for informing the processor of an approach of the radio frequency identification reader;
   wherein the processor is adapted to command the power block to provide electric power to the radio frequency identification module, and the radio frequency identification module is adapted to generate the radio frequency identification data.

2. The mobile terminal circuit of claim 1, wherein the radio frequency identification module includes a radio frequency identification memory (78) for storing the radio frequency identification data; a codec (404) for encoding the radio frequency identification data into radio frequency identification codec data; a modulator (405) connected to the codec, for modulating the radio frequency identification codec data into radio frequency identification modulation data; and a second clock generator (302) connected to the first clock generator, the codec, and the modulator, for

providing a second operation timing to the codec and the modulator.

3. The mobile terminal circuit of claim 1, further comprising:

a memory portion (102) for storing the radio frequency identification data together with mobile terminal protocol data,
wherein the processor is further connected to the memory portion and is further adapted to extract the radio frequency identification data, and to deliver the extracted radio frequency identification data to the radio frequency identification module.

4. The mobile terminal circuit of claim 3, wherein the radio frequency identification module includes a codec for encoding the radio frequency identification data into radio frequency identification codec data; a modulator connected to the codec, for modulating the radio frequency identification codec data into radio frequency identification modulation data; and a second clock generator connected to the first clock generator, the codec, and the modulator, for providing a second operation timing to the codec and the modulator.

5. The mobile terminal circuit of claim 3, wherein the processor extracts the radio frequency identification data from the memory portion in response to information indicating the approach of the radio frequency identification reader, provided from the detector, and delivers the extracted radio frequency identification data to the codec.

6. The mobile terminal circuit of claim 3 or 5, wherein the detector includes an interrupt port of the processor.

7. The mobile terminal circuit of one of claims 3 to 6, wherein the detector includes a frequency detector.

8. The mobile terminal circuit of one of claims 3 to 7, further comprising a rectifier for rectifying a voltage detected from a signal received via the antenna and delivering the rectified voltage to the processor.

9. A method for identifying a radio frequency in a mobile terminal including a processor, a power block and a radio frequency identification module, comprising the steps of:

informing, by a detector, the processor of an approach of a radio frequency identification reader, upon detecting the approach of the radio frequency identification reader;
extracting, by the processor, the radio frequency identification data from a memory portion and delivering the extracted radio frequency identification data to the radio frequency identification module, upon detecting the approach of the radio frequency identification reader; and
encoding and modulating, by the radio frequency identification module, the delivered radio frequency identification data and transmitting the modulated radio frequency identification data to the radio frequency identification reader;
wherein the processor commands the power block to provide electric power to the radio frequency identification module upon detecting the approach of the radio frequency identification reader.

Patentansprüche

1. Schaltung eines Mobil-Endgerätes zum Senden von Funkfrequenz-Identifizierungsdaten zu einer Funkfrequenz-Identiflzierungs-Leseeinrichtung, die umfasst:

eine Antenne (200) zum Kommunizieren mit der Funkfrequenz- Identifizierungs- Leseeinrichtung;
eine erste Takterzeugungseinrichtung (250) zum Bereitstellen einer ersten Arbeits-Taktung für jedes elektrische Element der Schaltung des Mobil-Endgerätes;
ein Funkfrequenz-Identifizierungsmodul (600) zum Durchführen einer Funkfrequenz-Identifizierungsfunktion;
einen Stromversorgungsblock (112) zum Bereitstellen von Arbeitsstrom für die elektrischen Elemente der Schaltung des Mobil-Endgerätes;
eine Verarbeitungseinrichtung (550B), die mit dem Stromversorgungsblock, der ersten Takterzeugungseinrichtung und dem Funkfrequenz-Identifizierungsmodul verbunden ist; und
eine Erfassungseinrichtung (501), die mit der Antenne und der Verarbeitungseinrichtung verbunden ist, um die Verarbeitungseinrichtung über eine Annäherung der Funkfrequenz-Identifizierungs-Leseeinrichtung zu informieren;
wobei die Verarbeitungseinrichtung so eingerichtet ist, dass sie den Stromversorgungsblock anweist, dem Funkfrequenz-Identifizierungsmodul Strom bereitzustellen, und das Funkfrequenz-Identifizierungsmodul so eingerichtet ist, dass es die Funkfrequenz-Identifizierungsdaten erzeugt.

2. Schaltung eines Mobil-Endgerätes nach Anspruch 1, wobei das Funkfrequenz-Identifizierungsmodul einen Funkfrequenz-Identifizierungsspeicher (78) zum Speichern der Funkfrequenz-Identifizierungs-

daten, einen Codec (404) zum Kodieren der Funkfrequenz-Identifizierungsdaten zu Funkfrequenz-Identifizierungs-Codec-Daten; eine Modulationseinrichtung (405), die mit dem Codec verbunden ist, um die Funkfrequenz-Identifizierungs-Codec-Daten zu Funkfrequenz- Identifizierungs- Modulationsdaten zu modulieren; und eine zweite Takterzeugungseinrichtung (302) enthält, die mit der ersten Takterzeugungseinrichtung, dem Codec und der Modulationseinrichtung verbunden ist, um dem Codec und der Modulationseinrichtung eine zweite Arbeits-Taktung bereitzustellen.

3. Schaltung eines Mobil-Endgerätes nach Anspruch 1, die des Weiteren umfasst:

einen Speicherabschnitt (102) zum Speichern der Funkfrequenz-Identifizierungsdaten zusammen mit Protokolldaten des Mobil-Endgerätes,
wobei die Verarbeitungseinrichtung des Weiteren mit dem Speicherabschnitt verbunden ist und weiterhin so eingerichtet ist, dass sie die Funkfrequenz-Identifizierungsdaten extrahiert und die extrahierten Funkfrequenz-Identifizierungsdaten dem Funkfrequenz-Identifizierungsmodul liefert.

4. Schaltung eines Mobil-Endgerätes nach Anspruch 3, wobei das Funkfrequenz-Identifizierungsmodul einen Codec zum Kodieren der Funkfrequenz-Identifizierungsdaten zu Funkfrequenz-Identifizierungs-Codec-Daten; eine Modulationseinrichtung, die mit dem Codec verbunden ist, um die Funkfrequenz-Identifizierungs-Codec-Daten zu Funkfrequenz-Identifizierungs-Modulationsdaten zu modulieren; und eine zweite Takterzeugungseinrichtung enthält, die mit der ersten Takterzeugungseinrichtung, dem Codec und der Modulationseinrichtung verbunden ist, um dem Codec und dem Modulator eine zweite Arbeits-Taktung bereitzustellen.

5. Schaltung eines Mobil-Endgerätes nach Anspruch 3, wobei die Verarbeitungseinrichtung in Reaktion auf Informationen, die die Annäherung der Funkfrequenz-Identifizierungs-Leseeinrichtung anzeigen und von der Erfassungseinrichtung bereitgestellt werden, die Funkfrequenz-Identfizierungsdaten aus dem Speicherabschnitt extrahiert und die extrahierten Funkfrequenz-Identfizierungsdaten dem Codec liefert.

6. Schaltung eines Mobil-Endgerätes nach Anspruch 3 oder 5, wobei die Erfassungseinrichtung einen Interrupt-Port der Verarbeitungseinrichtung enthält.

7. Schaltung eines Mobil-Endgerätes nach einem der Ansprüche 3 bis 6, wobei die Erfassungseinrichtung eine Frequenz-Erfassungseinrichtung enthält.

8. Schaltung eines Mobil-Endgerätes nach einem der Ansprüche 3 bis 7, die des Weiteren einen Gleichrichter umfasst, der eine Spannung gleichrichtet, die aus einem über die Antenne empfangenen Signal erfasst wird, und die gleichgerichtete Spannung der Verarbeitungseinrichtung liefert.

9. Verfahren zum Identifizieren einer Funkfrequenz in einem Mobil-Endgerät, das eine Verarbeitungseinrichtung, einen Stromversorgungsblock und ein Funkfrequenz-Identifizierungsmodul enthält, wobei es die folgenden Schritte umfasst:

Informieren der Verarbeitungseinrichtung über eine Annäherung einer Funkfrequenz-Identifizierungs-Leseeinrichtung durch eine Erfassungseinrichtung beim Erfassen der Annäherung der Funkfrequenz-Identifizierungs-Leseeinrichtung;
Extrahieren der Funkfrequenz-Identifizierungsdaten aus einem Speicherabschnitt durch die Verarbeitungseinrichtung und Liefern der extrahierten Funkfrequenz-Identifizierungsdaten an das Funkfrequenz-Identifizierungsmodul beim Erfassen der Annäherung der Funkfrequenz-Identifizierungs-Leseeinrichtung; und
Kodieren und Modulieren der gelieferten Funkfrequenz-Identifizierungsdaten durch das Funkfrequenz-Identifizierungsmodul und Senden der modulierten Funkfrequenz-Identifizierungsdaten an die Funkfrequenz-Identifizierungs-Leseeinrichtung;
wobei die Verarbeitungseinrichtung den Stromversorgungsblock anweist, dem Funkfrequenz-Identifizierungsmodul beim Erfassen der Annäherung der Funkfrequenz-Identifizierungs-Leseeinrichtung Strom bereitzustellen.

Revendications

1. Circuit pour terminal mobile destiné à transmettre des données d'identification de fréquence radio à un lecteur d'identification de fréquence radio, comprenant :

une antenne (200) pour communiquer avec le lecteur d'identification de fréquence radio ;
un premier générateur d'horloge (250) pour fournir un premier cadencement de fonctionnement à chaque élément électrique du circuit pour terminal mobile ;
un module d'identification de fréquence radio (600) pour exécuter une fonction d'identification de fréquence radio ;
un bloc d'alimentation (112) pour fournir l'ali-

mentation de fonctionnement aux éléments électriques du circuit pour terminal mobile ;
un processeur (550B) connecté au bloc d'alimentation, au premier générateur d'horloge et au module d'identification de fréquence radio ; et
un détecteur (501) connecté à l'antenne et au processeur pour informer le processeur d'une approche du lecteur d'identification de fréquence radio ;
dans lequel le processeur est conçu pour ordonner au bloc d'alimentation de fournir de l'énergie électrique au module d'identification de fréquence radio, et dans lequel le module d'identification de fréquence radio est conçu pour générer des données d'identification de fréquence radio.

2. Circuit pour terminal mobile selon la revendication 1, dans lequel le module d'identification de fréquence radio comporte une mémoire d'identification de fréquence radio (78) destinée à stocker les données d'identification de fréquence radio ; un codec (404) pour coder les données d'identification de fréquence radio en des données de codec d'identification de fréquence radio ; un modulateur (405) connecté au codec pour moduler les données de codec d'identification de fréquence radio en des données de modulation d'identification de fréquence radio ; et un deuxième générateur d'horloge (302) connecté au premier générateur d'horloge, au codec et au modulateur pour fournir un deuxième instant de fonctionnement au codec et au modulateur.

3. Circuit pour terminal mobile selon la revendication 1, comprenant en outre :

une partie formant mémoire (102) pour stocker les données d'identification de fréquence radio en association avec des données de protocole du terminal mobile,
dans lequel le processeur est en outre connecté à la partie formant mémoire et est en outre conçu pour extraire les données d'identification de fréquence radio et pour délivrer les données d'identification de fréquence radio extraites au module d'identification de fréquence radio.

4. Circuit pour terminal mobile selon la revendication 3, dans lequel le module d'identification de fréquence radio comporte un codec pour coder les données d'identification de fréquence radio en des données de codec d'identification de fréquence radio ; un modulateur connecté au codec, pour moduler les données de codec d'identification de fréquence radio en des données de modulation d'identification de fréquence radio ; et un deuxième générateur d'horloge connecté au premier générateur d'horloge, au codec et au modulateur, pour fournir un deuxième cadencement de fonctionnement au codec et au modulateur.

5. Circuit pour terminal mobile selon la revendication 3, dans lequel le processeur extrait les données d'identification de fréquence radio de la partie formant mémoire en réponse à des informations indiquant l'approche du lecteur d'identification radiofréquence, fournies par le détecteur, et délivre les données d'identification de fréquence radio extraites au codec.

6. Circuit pour terminal mobile selon la revendication 3 ou 5, dans lequel le détecteur comporte un accès d'interruption du processeur.

7. Circuit pour terminal mobile selon l'une des revendications 3 à 6, dans lequel le détecteur comporte un détecteur de fréquence.

8. Circuit pour terminal mobile selon l'une des revendications 3 à 7, comprenant en outre un redresseur pour redresser une tension détectée à partir d'un signal reçu via l'antenne et pour délivrer la tension redressée au processeur.

9. Procédé pour identifier une fréquence radio dans un terminal mobile comportant un processeur, un bloc d'alimentation et un module d'identification de fréquence radio, comprenant les étapes consistant :

à informer, au moyen d'un détecteur, le processeur de l'approche d'un lecteur d'identification de fréquence radio, lors de la détection de l'approche du lecteur d'identification de fréquence radio ;
à extraire, par le processeur, les données d'identification de fréquence radio d'une partie formant mémoire et à délivrer les données d'identification de fréquence radio extraites au module d'identification de fréquence radio lors de la détection de l'approche du lecteur d'identification de fréquence radio ; et
à coder et moduler, par le module d'identification de fréquence radio, les données d'identification de fréquence radio délivrées et à transmettre les données d'identification de fréquence radio modulées au lecteur d'identification de fréquence radio ;
dans lequel le processeur ordonne au bloc d'alimentation de fournir de l'énergie électrique au module d'identification de fréquence radio lors de la détection de l'approche du lecteur d'identification de fréquence radio.

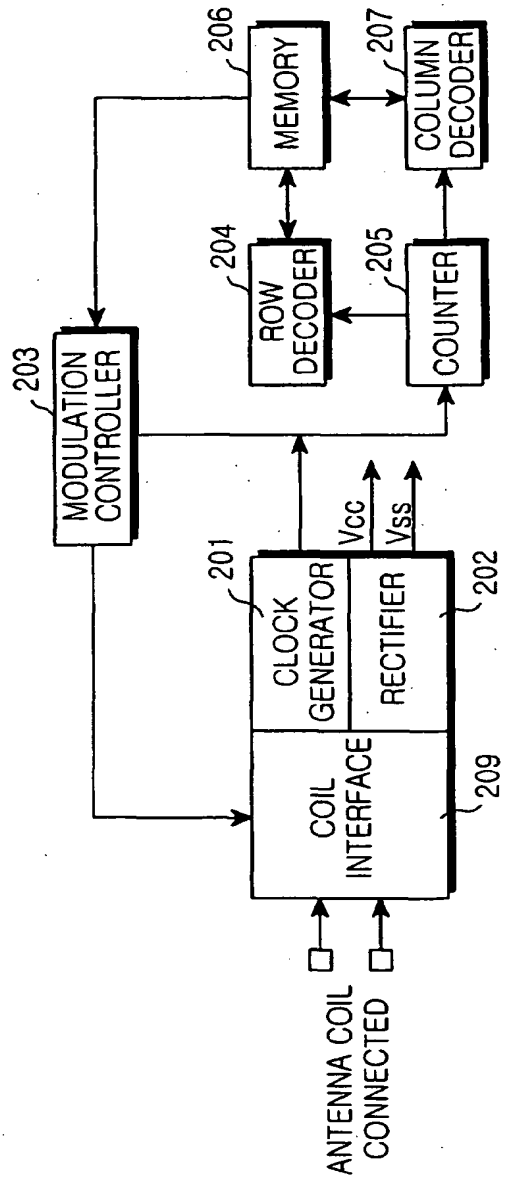
206
MEMORY
207
COLUMN DECODER
204
ROW DECODER
205
COUNTER
203
MODULATION CONTROLLER
201
CLOCK GENERATOR
Vcc
Vss
RECTIFIER
202
COIL INTERFACE
209
ANTENNA COIL CONNECTED

FIG. 1

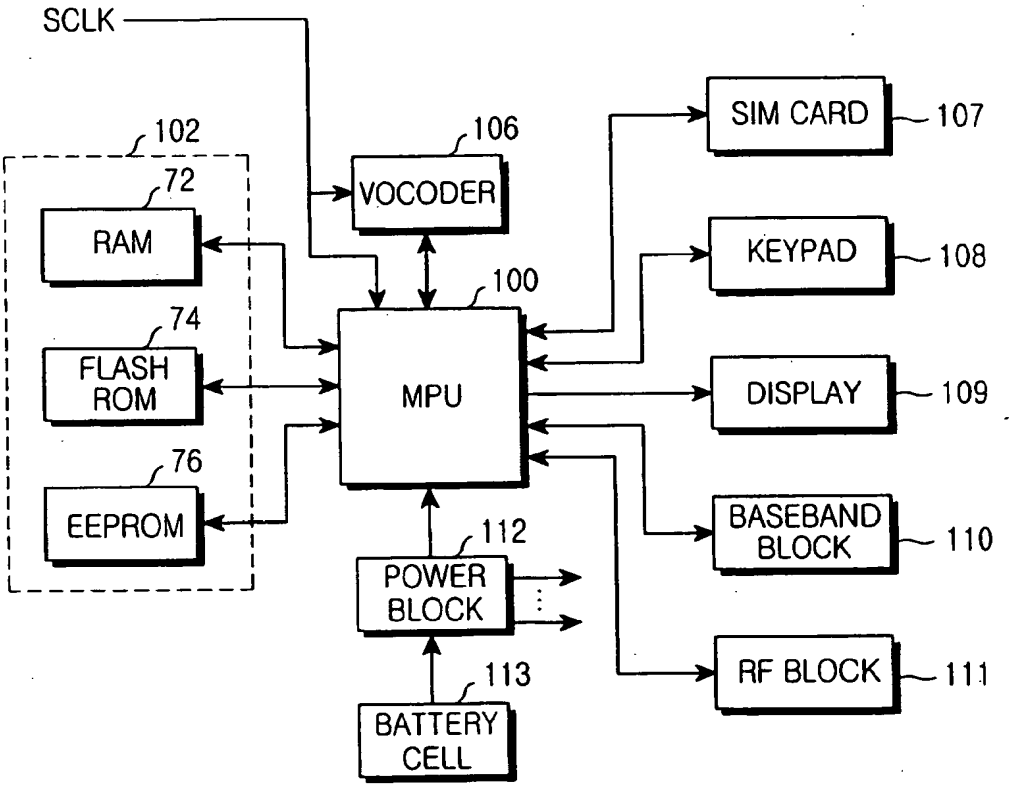
SCLK
102
72
RAM
74
FLASH ROM
76
EEPROM
106
VOCODER
100
MPU
112
POWER BLOCK
113
BATTERY CELL
SIM CARD
107
KEYPAD
108
DISPLAY
109
BASEBAND BLOCK
110
RF BLOCK
111

FIG.2

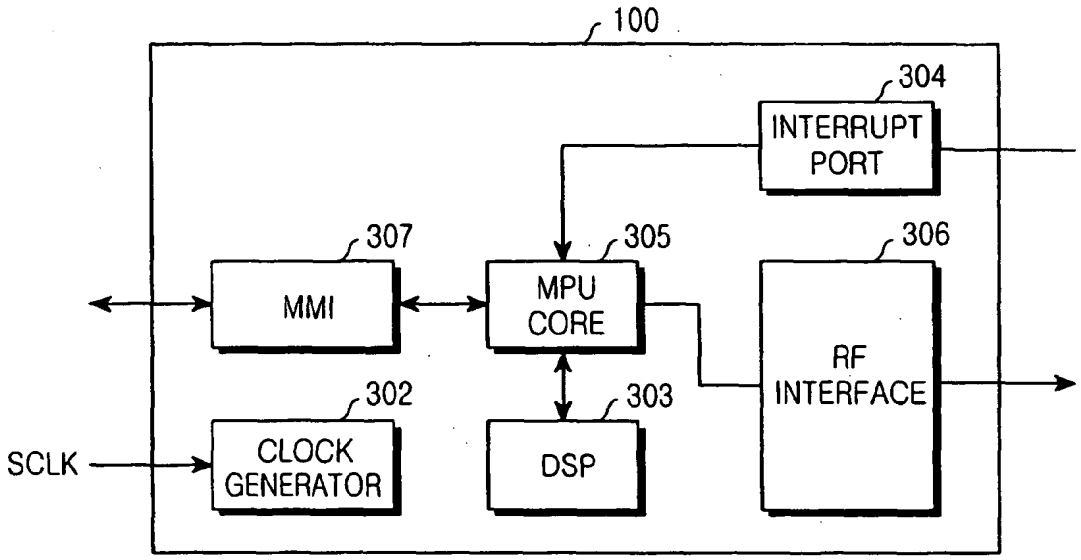
100
304
INTERRUPT PORT
307
MMI
305
MPU CORE
306
RF INTERFACE
302
CLOCK GENERATOR
303
DSP
SCLK

FIG.3

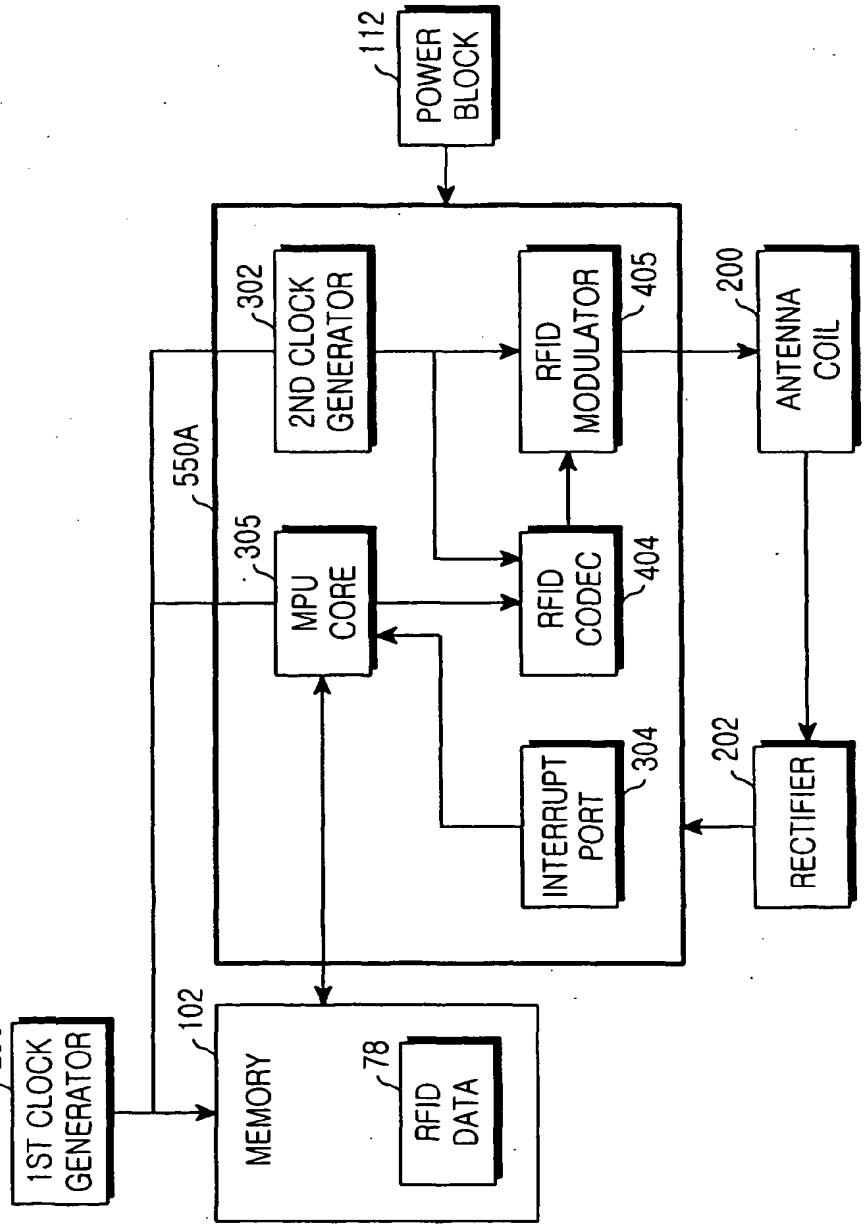
112
POWER BLOCK
302
2ND CLOCK GENERATOR
405
RFID MODULATOR
200
ANTENNA COIL
550A
305
MPU CORE
404
RFID CODEC
304
INTERRUPT PORT
202
RECTIFIER
250
1ST CLOCK GENERATOR
102
MEMORY
78
RFID DATA

FIG.4

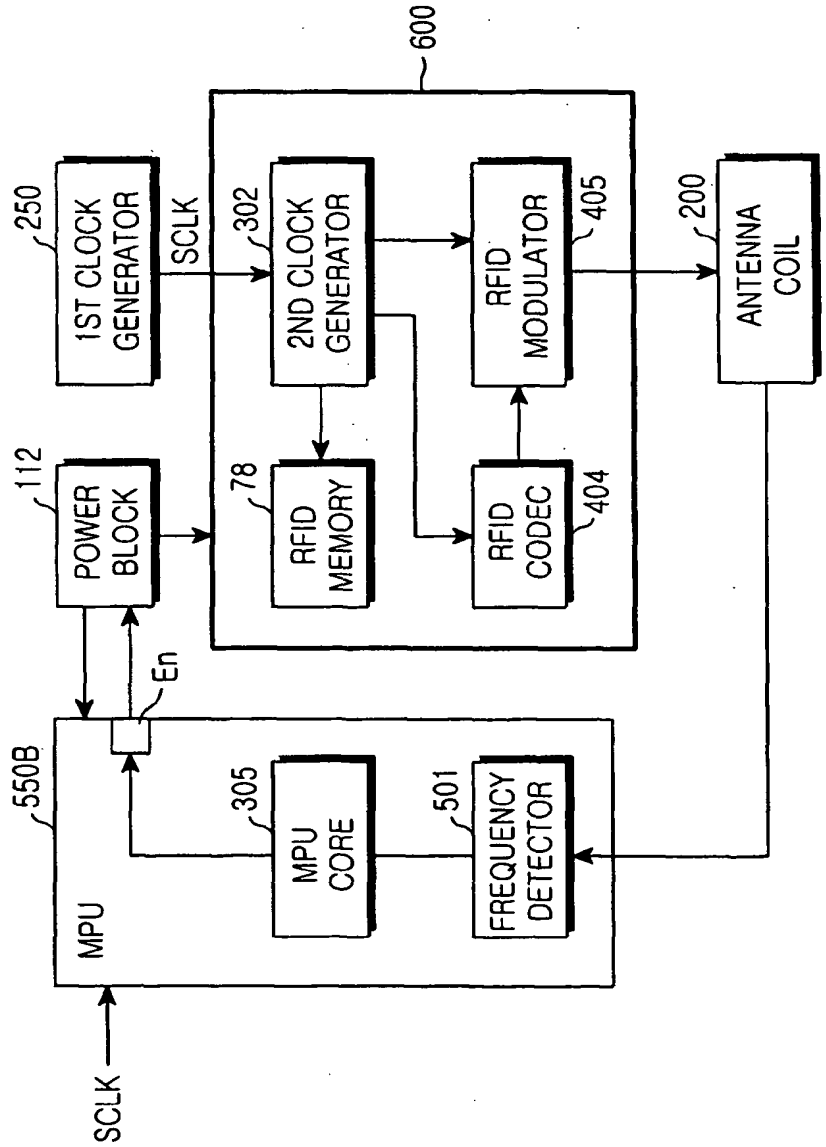
600
250
1ST CLOCK GENERATOR
SCLK
302
2ND CLOCK GENERATOR
RFID MODULATOR
405
200
ANTENNA COIL
112
POWER BLOCK
78
RFID MEMORY
RFID CODEC
404
En
550B
MPU
305
MPU CORE
501
FREQUENCY DETECTOR
SCLK

FIG.5

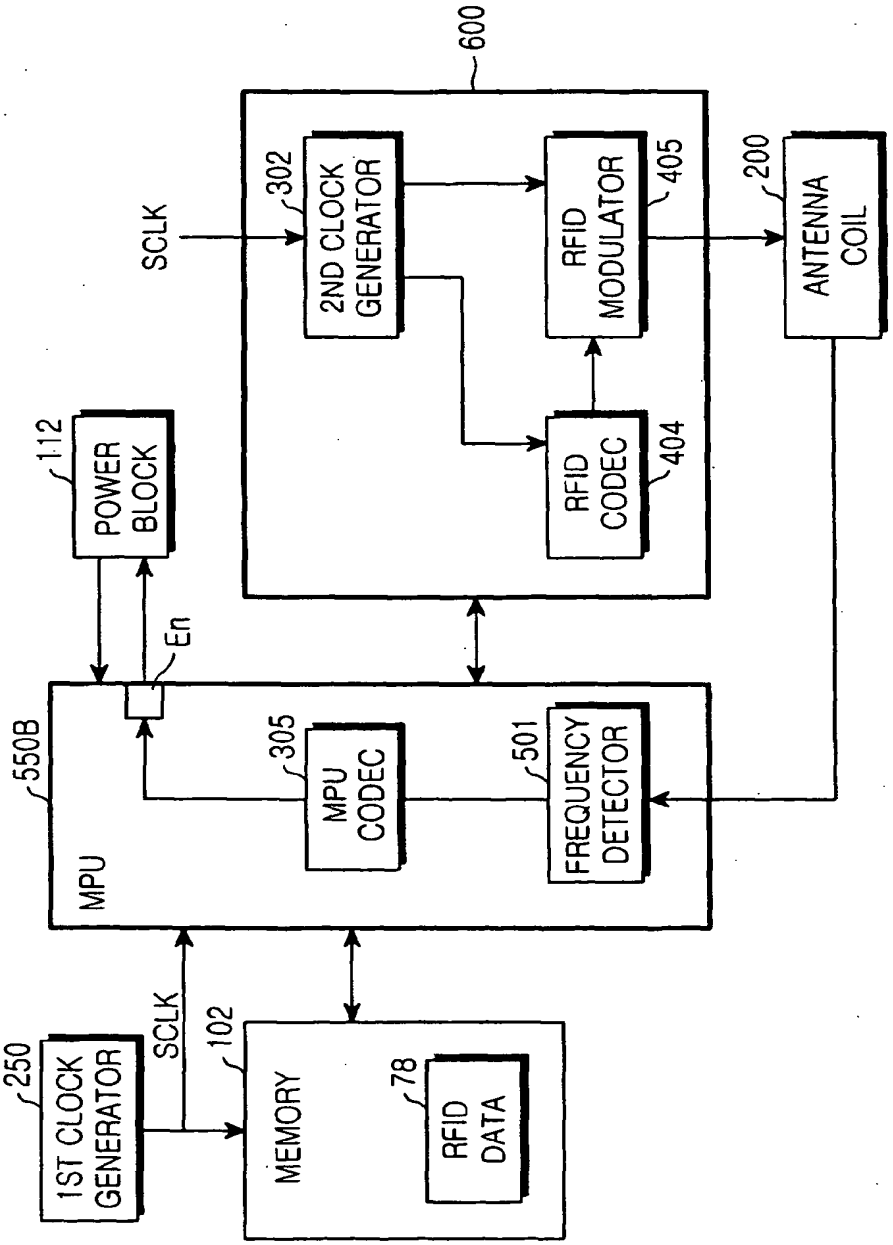
600
SCLK
302
2ND CLOCK GENERATOR
RFID MODULATOR
405
200
ANTENNA COIL
RFID CODEC
404
112
POWER BLOCK
En
550B
MPU
305
MPU CODEC
501
FREQUENCY DETECTOR
250
1ST CLOCK GENERATOR
SCLK
102
MEMORY
78
RFID DATA

FIG.6

REFERENCES CITED IN THE DESCRIPTION

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